

*AMENDMENTS TO THE CLAIMS*

1. (Currently Amended) A nitrogen-free ozone generator system, comprising:  
a first electrode;  
a second electrode which is opposite to the first electrode and forms a discharge region having a gap;  
raw material gas supply means for supplying ~~an~~ oxygen ~~gas~~ as a raw material gas; and  
a catalytic material which is provided on a dielectric or ~~the~~ an electrode in the discharge region and contains a photocatalytic material with a band gap energy of 2.0 eV to 2.9 eV, wherein, when an AC voltage is applied between the first electrode and the second electrode from a power supply to ~~inject produce a discharge electric power into~~ in the discharge region, and the oxygen ~~gas~~ is supplied from the raw material gas supply means to the discharge region, then discharge light having ~~at least a light~~ wavelength in a range of 428 nm to 620 nm ~~is irradiated to~~ irradiates the catalytic material ~~by from the~~ discharge, the catalytic material is excited to dissociate the oxygen ~~gas~~ passing through the discharge region into oxygen atoms, ~~a~~ gas pressure of the discharge region through which the oxygen ~~gas~~ passes is kept at 0.1 MPa to 0.4 MPa, and the oxygen ~~gas~~ and the ~~dissociated oxygen atom~~ atoms are subjected to a bonding process to generate ~~an ozone gas~~.

2. (Currently Amended) ~~A~~ The nitrogen-free ozone generator system according to claim 1, wherein ~~purity of the oxygen gas is~~ has a purity of at least 99.99% or higher.

3. (Currently Amended) ~~A~~ The nitrogen-free ozone generator system according to claim 1, wherein ~~a the gap interval of the discharge region having the gap is~~ no larger than 0.6 mm or less.

4. (Currently Amended) ~~A~~ The nitrogen-free ozone generator system according to claim 1, wherein the oxygen contains a noble gas, as an auxiliary gas ~~is contained in the oxygen gas at~~, in a concentration of 500 ppm to 50000 ppm with respect to the oxygen gas, and ~~an accelerating ozone generation reaction is accelerated~~.

5. (Currently Amended) ~~A~~ The nitrogen-free ozone generator system according to claim 1, wherein the catalytic material is applied to a wall surface of the dielectric or the electrode in the discharge region, and a contact surface area between the catalytic material and the discharge light is 1.5 times as large as ~~an~~ area of the dielectric or the electrode.

6. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the catalytic material is a powder of the photocatalytic material having a particle diameter of 0.1  $\mu\text{m}$  to 50  $\mu\text{m}$  and adhered to a wall surface of the dielectric or the electrode in the discharge region to increase ~~a~~ surface area.

7. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein ~~a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$  is formed on~~ a wall surface of the dielectric or the electrode in the discharge region has a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$ , and the catalytic material is provided on the wall surface ~~on which the roughness is formed, and a so that~~ surface area of the catalytic material is increased.

8. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the dielectric in the discharge region is a dielectric through which the discharge light passes, and the catalytic material is ~~the a~~ photocatalytic material powder of 1% to 10% in volume ratio contained in the dielectric through which the discharge light passes.

9. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the dielectric in the discharge region is a dielectric through which the discharge light passes, the photocatalytic material is provided on the electrode in the discharge region, and the photocatalytic material on a discharge region side is covered with the dielectric through which the discharge light passes.

10. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the photocatalytic material includes at least one material selected from the group consisting of  $\text{Cu}_2\text{O}$ ,  $\text{In}_2\text{O}_3$ ,  $\text{Fe}_2\text{TiO}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Cr}_2\text{O}_3$ ,  $\text{PbO}$ ,  $\text{V}_2\text{O}_5$ ,  $\text{FeTiO}_3$ ,  $\text{WO}_3$ , and  $\text{Bi}_2\text{O}_3$ .

11. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the photocatalytic material includes at least one ~~of materials made of rare-earth metal ion-complexes~~ selected from the group consisting of  $\text{Nb}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{W}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{Ta}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{In}_{2m}\text{P}_4\text{O}_{4m+4}$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{MnTi}_6\text{O}_{13}$ ,  $\text{TiO}_a\text{Nb}_b\text{F}_c$ ,  $\text{SrTiO}_a\text{Nb}_b\text{F}_c$ ,  $\text{BaTiO}_a\text{Nb}_b\text{F}_{c_1}$  and plural elements combinations thereof.

12. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 1, wherein the photocatalytic material is doped with a material, as an auxiliary catalyst, selected from the group consisting of Ru, Ni, Pt, RuO<sub>2</sub>, NiOX-~~ox~~, and NiO.

13. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein the catalytic material is applied to a wall surface of the dielectric or the electrode in the discharge region, and a contact surface area between the catalytic material and the discharge light is 1.5 times as large as ~~an~~ area of the dielectric or the electrode.

14. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein the catalytic material is a powder of the photocatalytic material having a particle diameter of 0.1  $\mu\text{m}$  to 50  $\mu\text{m}$  and adhered to a wall surface of the dielectric or the electrode in the discharge region to increase ~~a~~ surface area.

15. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein ~~a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$  is formed on~~ a wall surface of the dielectric or the electrode in the discharge region has a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$ , and the catalytic material is provided on the wall surface ~~on which the roughness is formed, and a~~ so that surface area of the catalytic material is increased.

16. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein the dielectric in the discharge region is a dielectric through which the discharge light passes, and the catalytic material is a photocatalytic material powder of 1% to 10% in volume ratio contained in the dielectric through which the discharge light passes.

17. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein the dielectric in the discharge region is a dielectric through which the discharge light passes, the photocatalytic material is provided on the electrode in the discharge region, and the photocatalytic material on a discharge region side is covered with the dielectric through which the discharge light passes.

18. (Currently Amended) ~~A=~~The nitrogen-free ozone generator system according to claim 4, wherein the photocatalytic material includes at least one material selected from the group consisting of Cu<sub>2</sub>O, In<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>TiO<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub>, PbO, V<sub>2</sub>O<sub>5</sub>, FeTiO<sub>3</sub>, WO<sub>3</sub>, and Bi<sub>2</sub>O<sub>3</sub>.

19. (Currently Amended) ~~A~~The nitrogen-free ozone generator system according to claim 4, wherein the photocatalytic material includes at least one of materials made of rare-earth metal ion-complexes complex selected from the group consisting of  $\text{Nb}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{W}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{Ta}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{In}_{2m}\text{P}_4\text{O}_{6m+4}$ ,  $\text{BaTi}_4\text{O}_9$ ,  $\text{MnTi}_6\text{O}_{13}$ ,  $\text{TiO}_a\text{N}_b\text{F}_c$ ,  $\text{SrTiO}_a\text{N}_b\text{F}_c$ ,  $\text{BaTiO}_a\text{N}_b\text{F}_c$ , and plural elements mixtures thereof.

20. ~~A~~The nitrogen-free ozone generator system according to claim 4, wherein the photocatalytic material, is doped with a material as an auxiliary catalyst, selected from the group consisting of Ru, Ni, Pt,  $\text{RuO}_2$ ,  $\text{NiOX}$ ~~or~~, and NiO.

21. (Currently Amended) A nitrogen suppression ozone generator system, comprising:

- a first electrode;
- a second electrode which is opposite to the first electrode and forms a discharge region having a gap;
- raw material gas supply means for supplying ~~an oxygen gas~~ as a raw material gas;
- nitrogen gas supply means for supplying ~~a nitrogen gas~~; and
- a catalytic material which is provided on a dielectric or ~~the~~ an electrode in the discharge region and contains a photocatalytic material with a band gap energy of 2.0 eV to 3.6 eV, wherein, when an AC voltage is applied between the first electrode and the second electrode from a power supply to ~~inject produce a discharge electric power into~~ in the discharge region, and the ~~oxygen gas~~ is supplied from the raw material gas supply means to the discharge region, the ~~nitrogen gas~~, in a range of 10 ppm to 500 ppm, is supplied for acceleration of an ozone generation reaction to the ~~oxygen gas~~ from the nitrogen gas supply means, then discharge light having ~~at least a light~~ wavelength in a range of 344 nm to 620 nm is irradiated to irradiates the catalytic material by from the discharge, the catalytic material is excited to dissociate the ~~oxygen gas~~ passing through the discharge region into oxygen atoms, ~~a gas pressure of the discharge region through which the oxygen gas passes is kept at 0.1 MPa to 0.4 MPa, and the oxygen gas and the dissociated oxygen atom atoms are subjected to a bonding process to generate an ozone gas.~~

22. (Currently Amended) ~~A~~The nitrogen suppression ozone generator system according to claim 21, wherein the oxygen contains a noble gas, as an auxiliary gas ~~is contained in the oxygen gas at, in a concentration of 500 ppm to 50000 ppm with respect to the oxygen gas, and an accelerating ozone generation reaction is accelerated.~~

23. (Currently Amended) ~~A~~The nitrogen suppression ozone generator system according to claim 21, wherein the catalytic material is applied to a wall surface of the dielectric or the electrode in the discharge region, and a contact surface area between the catalytic material and the discharge light is 1.5 times as large as ~~an~~ area of the dielectric or the electrode.

24. (Currently Amended) ~~A~~The nitrogen suppression ozone generator system according to claim 21, wherein the catalytic material is a powder of the photocatalytic material having a particle diameter of 0.1  $\mu\text{m}$  to 50  $\mu\text{m}$  and adhered to a wall surface of the dielectric or the electrode in the discharge region to increase ~~a~~ surface area.

25. (Currently Amended) ~~A~~The nitrogen suppression ozone generator system according to claim 21, wherein ~~a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$  is formed on a wall surface of the dielectric or the electrode in the discharge region~~ has a roughness of 1  $\mu\text{m}$  to 50  $\mu\text{m}$ , and the catalytic material is provided on the wall surface on which the roughness is formed, and a so that surface area of the catalytic material is increased.

26. (Currently Amended) ~~A~~The nitrogen suppression ozone generator system according to claim 21, wherein the dielectric in the discharge region is a dielectric through which the discharge light passes, and the catalytic material is a photocatalytic material powder of 1% to 10% in volume ratio contained in the dielectric through which the discharge light passes.

27. (Currently Amended) ~~A~~The nitrogen-free ozone generator system according to ~~any one of claims claim 1 to 20~~, used for a chemical vapor deposition apparatus or an ALD (atomic layer deposition) thin film deposition apparatus.

28. (Currently Amended) ~~A~~The nitrogen-free ozone generator system according to ~~any one of claims claim 1 to 20~~, used for a chemical vapor deposition apparatus or an ALD (atomic layer deposition) thin film deposition apparatus for producing any one of a nonvolatile memory ferroelectric thin film, a high dielectric constant dielectric thin film, a nitride metal thin film, an oxide metal, an optical material thin film, a high density photomagnetic recording thin film, a superconducting thin film, and a high quality capacitor thin film.

29. (Currently Amended) ~~A~~The nitrogen-free ozone generator system according to ~~any one of claims claim 1 to 20~~, used for an ozone condensing apparatus.

30. (Currently Amended) ~~A~~The nitrogen-free ozone generator system according to ~~any one of claims claim 1 to 20~~, used for a pulp bleaching apparatus.

31. (Currently Amended) A nitrogen-free ozone generating method ~~provided with~~ employing a first electrode, a second electrode which is opposite to the first electrode and forms a discharge region ~~having a gap, raw material gas supply means for supplying an oxygen gas as a raw material gas, and a catalytic material which is provided on a dielectric or the electrode in the discharge region and contains~~ containing a photocatalytic material with a band gap energy of 2.0 eV to 2.9 eV, ~~wherein the method comprising:~~

~~applying an AC voltage is applied between the first electrode and the second electrode from a power supply to inject produce a discharge electric power into in the discharge region, the supplying oxygen gas is supplied from the raw material gas supply means to the discharge region, thereby producing discharge light having at least a light wavelength in a range of 428 nm to 620 nm is irradiated to and irradiating the catalytic material by from the~~ discharge,

~~exciting the catalytic material is excited to dissociate the oxygen gas passing through the discharge region into oxygen atoms, and~~

~~a maintaining gas pressure of the discharge region through which the oxygen gas passes is kept at 0.1 MPa to 0.4 MPa, and so that the oxygen gas and the dissociated oxygen atom are subjected to a bonding process atoms bond to generate an ozone gas.~~

32. (Currently Amended) A nitrogen suppression ozone generating method, ~~provided with~~ employing a first electrode, a second electrode which is opposite to the first electrode and forms a discharge region ~~having a gap, raw material gas supply means for supplying an oxygen gas as a raw material gas, nitrogen gas supply means for supplying a nitrogen gas, and a catalytic material which is provided on a dielectric or the electrode in the discharge region and contains~~ containing a photocatalytic material with a band gap energy of 2.0 eV to 3.6 eV, ~~wherein the method comprising:~~

~~applying an AC voltage is applied between the first electrode and the second electrode from a power supply to inject produce a discharge electric power into in the discharge region, the supplying oxygen gas is supplied from the raw material gas supply means to the~~

discharge region,

~~the supplying~~ nitrogen gas in a concentration range of 10 ppm to 500 ppm ~~is supplied~~  
to the oxygen for acceleration of ~~an~~ ozone generation ~~reaction to the oxygen gas from the~~  
~~nitrogen gas supply means~~, thereby producing discharge light having ~~at least a light~~  
wavelength in a range of 344 nm to 620 nm ~~is irradiated to~~ and irradiating the catalytic  
material ~~by~~ from the discharge,

exciting the catalytic material ~~is excited~~ to dissociate the oxygen gas passing through  
the discharge region ~~into oxygen atoms~~,

a maintaining gas pressure of the discharge region ~~through which the oxygen gas~~  
~~passes is kept~~ at 0.1 MPa to 0.4 MPa, ~~and so the oxygen gas and the dissociated oxygen atom~~  
~~are subjected to a bonding process~~ atoms bond to generate ~~an~~ ozone gas.